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## A QUIESCENT STAGE IN THE DEVELOPMENT OF *TERMES FLAVIPES* KOLLAR.<sup>1</sup>

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(WITH PLATE IX.)

During the early spring of the present year Professor W. M. Wheeler, of Harvard University, very kindly gave me some specimens of an apparently undescribed stage in the development of the imagines of our common white ant, *Termes flavipes*, which he had taken the previous year from several colonies at Ellenville, Mass., just prior to the swarming period. These individuals were, he noticed, very sluggish and unable to escape, as did the normal forms, when the colony was opened up. They were also conspicuous, owing to the fact that the wings were carried at some distance from the body as shown in Figs. 4, 5, and 6.

On Professor Wheeler's advice I examined nests this spring in the neighborhood of Boston in order to see whether this was a normal condition, and with his help I have been enabled to bring together the following facts.

The colonies of white ants first began to show activity toward the latter part of March and at this time consisted of numerous workers and nymphs with a smaller number of soldiers and complementary royal forms. The nymphs were then quite normal, and the wings were folded over the dorsal portion of the body in the usual position.

The colonies were kept under observation from time to time in order that specimens of maturing nymphs might be taken as soon as the first adults began to appear. In 1910 adults were first taken on April 20 and nymphs were still plentiful in material collected on April 24. This year however everything was very late and no adults were seen until May 6 when a number of freshly emerged imagines were found in a large colony. On the following day I intended to collect a large number of nymphs from various colonies that I might

<sup>1</sup> Contributions from the Entomological Laboratory of the Bussey Institution, Harvard University. No. 49.

see how they underwent their final ecdysis. Unfortunately the sudden rise in temperature at this time had so accelerated the swarming period that in every colony examined the nymphs had assumed the adult form and many were already becoming pigmented. A few nymphs and forms with outstanding wings were, however, found in one or two colonies and these were taken to the laboratory. From these it was seen that development proceeds as follows:

The mature nymph becomes very sluggish and finally all movement ceases; it then falls over on its side and the head is bent down till it lies on the ventral side of the body, along which also the antennæ and legs are extended in a backward direction (Fig. 1), while the wing pads are bent downwards till they lie laterally along the sides of the body (Fig. 2). It will be at once noticed that while in this position the nymph is to all appearances a quiescent *pupa libera*. There does not appear to be an ecdysis immediately prior to this quiescent period, however, so I would hesitate to describe it as a true pupal state though it undoubtedly has the same physiological function.

This quiescent stage lasted in the few specimens observed for a period varying from four to about nine hours. The duration in time seems to be controlled to a large extent by the amount of moisture in the earth surrounding the pupa for when specimens were placed in perfectly dry earth they were unable to pass beyond this stage of development, while the greater the amount of moisture the shorter the period. During this stage the last nymphal skin splits across the head and along the dorsum, and is slowly worked downward and backward till a large portion of it hangs freely from the apex of the abdomen on the ventral side. The legs are the last part of the body to be freed from this skin, which then becomes detached as a much crumpled mass. As soon as the wings are liberated they begin to move away from the body at their base. This is apparently due to the tracheæ in the basal portion of the wing becoming inflated. The inflation, however, does not extend beyond the suture along which the wing is subsequently broken off, and the distal portion remains tightly folded as shown in Fig. 3.

The ecdysis described above is the last in the development of the imago for the insect now disclosed is the sexually complete adult; it does not, however, become active as soon as it emerges but remains for about a quarter of an hour in the same position as that

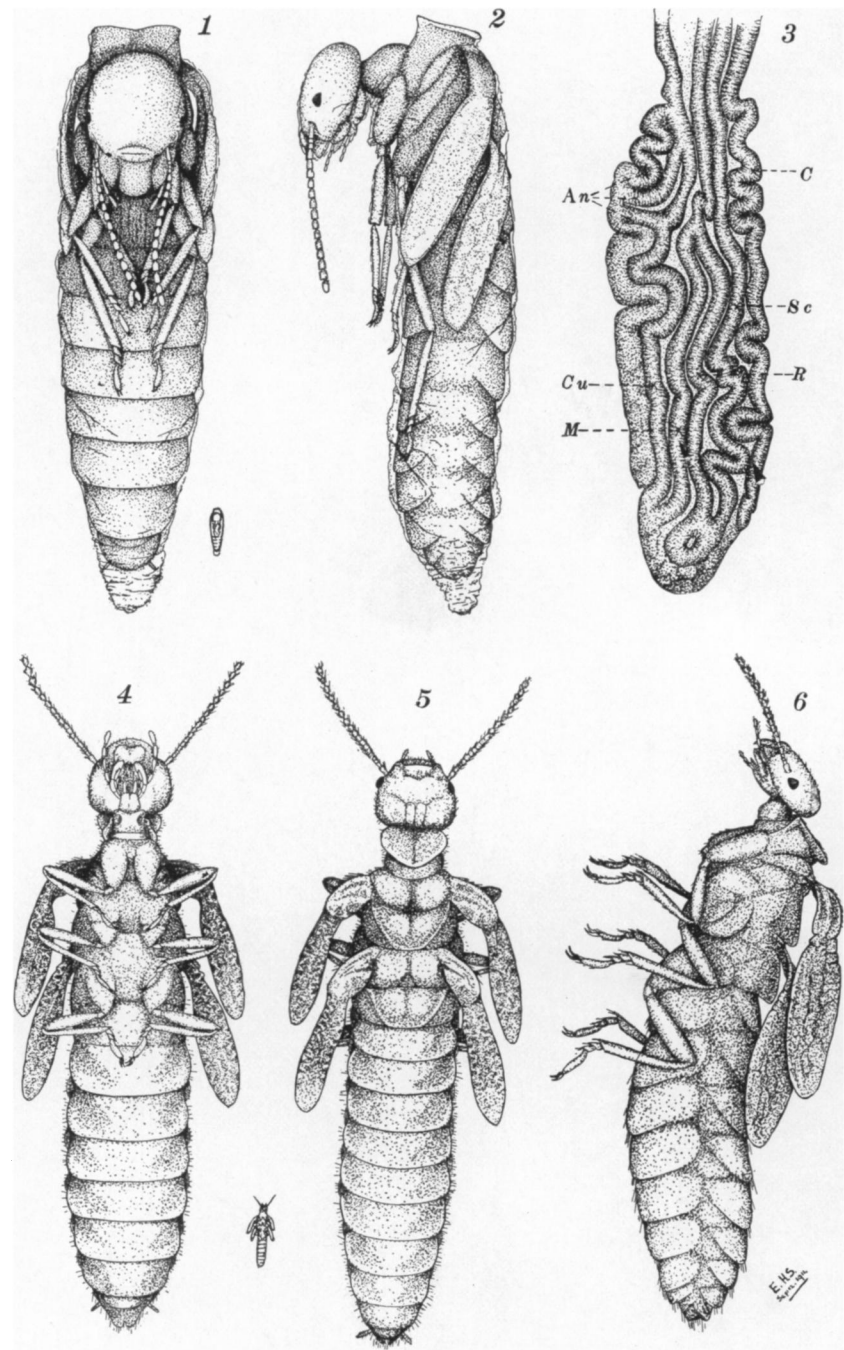
in which the ecdysis occurred. During this time, however, the head is slowly drawn upward to its normal position and the insect finally struggles to its feet. Its movements are at first very awkward and uncertain but after a few minutes it is actively running about. As before mentioned, the greater portion of the wings remains closely folded together so that at first sight they appear as abnormally placed wing-pads. A close examination with a hand lense shows them to consist of the very compactly folded wing. Fig. 3 is a somewhat diagrammatic illustration of one of the hind wings when in this condition. In it I have attempted to trace and name the various wing veins, though owing to the much folded membrane their outline was very indefinite and much less distinctly represented than in the illustration.

After these young adults have been running about for an hour or so the main portion of the wing begins to expand; the basal portion becomes fully expanded before the apical part begins to unfold, but the inflation gradually works toward the apex till the typical fully winged though pigmentless adult is produced. The wings continue to be held away from the body till this process is complete, after which they are folded from the base in an overlapping position over the abdomen. The ensuing pigmentation of the body is gradual and does not appear to be affected by the presence or absence of light; the entire body turns black through shades of yellow and brown till in about twenty-four hours the sexually complete imago is ready for swarming.

It will be seen that the whole period intervening between the normal nymphal stage and the typical pigmentless adult stage occupies only some nine to ten hours and this apparently accounts for its not having been recorded before, even though it appears to be perfectly normal, for it has occurred in different localities in two successive years and all the nymphs taken passed through these stages before completing their development.

An illustration of the thorax of *Termes flavipes* with unexpanded wings was given by Packard in his Text-book of Entomology, but he here described it as a late nymphal wing pad, otherwise there seem to be no references to either of the stages herein figured and described.

The nearest approach to the condition in *Termes flavipes* is that



Nymphs of *Termes flavipes*.

described by N. Holmgren<sup>1</sup> in the development of a South American termite, *Rhinotermes taurus*. In this case the worker larvæ immediately after ecdysis, pass into a quiescent condition, very similar in general appearance to the one I have described except for the fact that they have no wings, and remain in this condition for a period varying from one hour to three days. Escherich<sup>2</sup> states that this must be regarded physiologically as a pupal condition since internal changes also occur. It will be noticed that in this case the quiescent period occurs only in larvæ and then after an ecdysis, whereas in *Termes flavipes* it has only been seen to occur during the transition period between the nymphs and adults of the sexual forms and then for the greater part before the ecdysis, so that this approaches more closely to the normal pupal stage of Holometabolous insects.

#### EXPLANATION OF PLATE IX.

Fig. 1. Quiescent nymph of *Termes flavipes*, ventral view.

Fig. 2. Same, lateral view.

Fig. 3. Wing of adult *T. flavipes* before expansion. *c*, costal vein; *Sc*, subcostal vein; *R*, radius; *M*, median; *cu*, cubital; *An*, anals.

Fig. 4. Freshly emerged adult of *Termes flavipes*, ventral view.

Fig. 5. Same, dorsal view.

Fig. 6. Same, lateral view.

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### MISCELLANEOUS NOTES.

**Migration of *Alabama argillacea* Hübner.**—An unusual invasion of the cotton moth, *Alabama argillacea*, occurred apparently throughout the Middle States in late September and early October of the present year. According to the reports of those who have given the subject of the cotton moth careful study, the species, which is of South American or West Indian origin, feeds in the United States exclusively on the cotton plant. As cotton is grown no nearer to New York than Virginia the moths covered a distance by flight of at least four hundred miles in some instances. This seems remarkable when the condition of the specimens is taken into consideration, for in most cases

<sup>1</sup> Studien über südamerikanische Termiten. Zool. Jahrb. Abt. f. Syst., XXIII, 1906.

<sup>2</sup> Die Termiten oder Weissen Ameisen. Leipzig, W. Klinkhardt, 1909.